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SECURITY APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a security apparatus and a method for supplying a service to a user by confirming a use situation of the user and infringement situation of non-user in order to keep safety and reliability for the service.

2. Description of the Related Art

A method to specify the user in service-use area by electrical means and to execute security for each kind of service is very important in present electrical society. Various kinds of security means, for example, memorized number, magnetic card, IC card, wireless card, sound comparison, fingerprint comparison, retina comparison and face comparison, have been used. However, the memorized number, the magnetic card, the IC card and the wireless card specifies the user by information only the user knows or with a memory device key for only the user. Therefore, they are in danger of being used unjustly.

On the other hand, sound comparison, fingerprint comparison, retina comparison, and face comparison are effective personal confirmation means to detect an other's unjust use because the user's physical features are used as a key. However, the personal confirmation is only used at the beginning of service. After the service begins, the service can not be interrupted. Therefore, even if an other person changes for the user after the service is begun, the service can not be interrupted. In short, this kind of service includes danger that the other person utilizes the service unjustly. This kind of problem is included in the memorized number, the magnetic card, the IC card and the wireless card.

As mentioned above, the known security apparatuses include following problems.

(1) After security is cancelled by confirming the user, security function is not executed while supplying the service. Therefore, even if an other person changes for the user, the service is still supplied continuously.

(2) While supplying the service to the user, it often happens that an other person watches information not to be disclosed on display from behind the user. This problem occurs because security is not provided in the physical space surrounding the user and the apparatus even if security is executed inside the apparatus electrically. Especially, this problem happens when the service is supplied to the user in public place in which other persons are not excluded.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a security apparatus and method to supply a service to the user while safety and reliability for the service are kept.

According to the present invention, there is provided a security apparatus for a device supplying a service to a user, comprising: person discrimination means for recognizing a user requesting the service; use situation decision means for deciding whether the user is under a situation to use the service; infringement situation decision means for detecting whether a non-user intrudes into a use area the service to decide whether of the service is infringed; service control means for supplying the service to the user in case said person discrimination means recognizes the user, and for controlling a supply of the service if said use situation decision means decides the user is not under the situation to use the service or if said infringement situation decision means decides that the security of the service is infringed.

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Further in accordance with the present invention, there is provided a security method associated with supplying a service to a user, comprising the step of: recognizing a user desiring the service; supplying the service to the user if the user is recognized; deciding whether the user is under a situation to use the service; deciding whether a non-user intrudes into a use area of the service; and controlling the supply of the service if the user is not under the situation to use the service or if the non-user is intruding into the use area of the service.

Further in accordance with the present invention, there is also provided a computer readable memory containing computer-readable instructions to supply a service to a user, comprising: instruction means for causing a computer to recognize a user desiring the service; instruction means for causing a computer to supply the service to the user if the user is recognized; instruction means for causing a computer to decide whether the user is under a situation to use the service; instruction means for causing a computer to decide whether a non-user intrudes into a use area of the service; and instruction means for causing a computer to control a supply of the service if the user is decided not under the situation to use the service or the non-user is decided to intrude into the use area of the service.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the security apparatus according to the present invention.

FIG. 2 is a block diagram of the situation detection section of the security apparatus according to the present invention.

FIG. 3 is a flow chart of processing of a service supply permission section according to a first embodiment of the present invention.

FIG. 4 is a flow chart of processing of the service supply permission section according to a second embodiment of the present invention.

FIG. 5 is a flow chart of processing of the service supply permission section according to a third embodiment of the present invention.

FIG. 6 is a flow chart of processing of the service supply permission section according to a fourth embodiment of the present invention.

FIG. 7 is a block diagram of the security apparatus according to a fifth embodiment of the present invention.

FIG. 8 is a flow chart of processing of the service supply permission section according to the fifth embodiment of the present invention.

FIG. 9 is a flow chart of processing of the service supply permission section according to a sixth embodiment of the present invention.

FIG. 10 is a flow chart of processing of the service supply permission section according to a seventh embodiment of the present invention.

FIG. 11 is a block diagram of the security apparatus according to an eighth embodiment of the present invention.

FIG. 12 is a flow chart of processing of the service supply permission section according to the eighth embodiment of the present invention.

FIG. 13 is a schematic diagram of detection of visual lines of the user in the image according to the eighth embodiment of the present invention.

FIG. 14 is a flow chart of processing of the service supply permission section according to a ninth embodiment of the present invention.

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FIG. 15 is a schematic diagram of detection of visual lines of the non-user in the image according to the ninth embodiment of the present invention.

FIG. 16 is a flow chart of processing of the service supply permission section according to a tenth embodiment of the present invention.

FIG. 17 is a schematic diagram of supply method for the security apparatus by software according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS.

The embodiments of the present invention are described below with reference to the drawings. FIG. 1 is a block diagram of the security apparatus according to the present invention. The security apparatus of the present invention is comprised of a situation detection section 1, a service supply permission section 2 and a service supply section 3. The situation detection section 1 discriminates the user in service-use area, detects whether the user is under a situation to use the service (use situation) and detects whether a non-user infringes the security of the user (infringement situation). The detection result of the use situation and the infringement situation is outputted to the service supply permission section 2 as person information. In this place, the situation that the user can utilize the service represents that the user is confirmed to be permitted the supply of the service and the user continuously utilizes the service. A situation that the user continuously utilizes the service represents a status that the user actually interacts with the service application (the user inputs operation to system or the user is supplied output from the system). A status of non-interaction within predetermined time indicates thinking, chattering, looking away. Another status indicates when the user moves away from service use-space within a predetermined time.

The situation that a non-user infringes the security of the user represents that a person other than the confirmed user intentionally or accidentally uses the service while the service is supplied to the confirmed user. The other person can then interact with the operation or information to be disclosed only to the confirmed user. When the user interacts with the service application of the system through a display, the other person looks on the display behind the user. Otherwise, the other person intends to interact with the service application in the user's absence within the predetermined time.

In order to detect each situation, the situation detection section 1 monitors service-use area using image or sound. Especially, the use situation of the user and the infringement situation of the security are detected by the image (person detection/direction of face detection/person confirmation) and the sound (person detection/person specification/chattering detection). Monitoring may be wireless.

The service supply permission section 2 controls start/interruption/interruption and cancellation/end of the service for the service supply section 3 according to the detection result of the situation detection section 1. In this case, the service supply permission section 2 starts the supply of the service when the user is specified in the service-use area. The service supply permission section 2 controls the supply of the service in at least one of the cases where the user does not utilize the service or where the security of the user is infringed. Especially when the user does not utilize the service during the supply of the service, the supply of the service finishes. If the security of the user is infringed by

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another person, the supply of the service interrupts until the infringement is relieved. The service supply section 3 supplies various kinds of service under the control of the service supply permission section 2. For example, an uninhabited ATM (automatic teller's machine), a portable terminal, or a computer used by several persons may comprise the service supply section 3.

FIG. 2 is a block diagram of the situation detection section 1. In this case, an image is used as a way to discriminate the user, detecting the use situation, or detect an infringement situation. The situation detection section 1 is comprised of an image input section 11, a person area detection section 12, a person comparison section 13, a use situation decision section 14 and an infringement situation decision section 15. The image input section 11 inputs an image through a TV camera. The TV camera is set in the service use area for continuously observing the user to be supplied the service. The person area detection section 12 analyzes images input by the image input section 11 and monitors the secure area from the input image. For example, a difference between the input image and background image (uninhabited area) indicates a person present in the secure area. The person area detection section 12 outputs person detection information D1 when the person present is detected and outputs non-detection information D1 when the person present is not detected.

The person comparison section 13 compares the person present area image with the content of a person comparison dictionary to specify which person is present in the secure area image. The person comparison dictionary previously stores at least comparison information of persons permitted to use the service. The person comparison section 13 outputs person discrimination information D2 representing whether the person present coincides with a person permitted to use the service. If the person present coincides with a person permitted to use the service in the person comparison dictionary, the person present is registered as the user who can be supplied the service.

The use situation decision section 14 detects whether the user is under a situation capable of using the service. After the user of the person area is registered and if the registered user is now included in the person discrimination information D2, the user is decided to be capable of using the service. The use situation decision section 14 outputs use situation information D3 representing whether the user is capable of using the service.

The infringement situation decision section 15 detects whether a non-user infringes the security of the service. If a person other than the user utilizing the service now is included in the person discrimination information D2, the infringement situation decision section 15 decides that the security of the service is infringed, and outputs infringement situation information D4 indicates a breach of security. The person detection/non-detection information D1, the person discrimination information D2, the use situation information D3, the infringement situation information D4 are called person information. The person information is read out by the service supply permission section 2 (step S1 in FIG. 3 explained afterward) and referred at steps S3, S4, S8, S11 in FIG. 3.

FIG. 3 is a flow chart of processing of the service supply permission section 2. As mentioned above, the situation detection section 1 discriminates the user in the service-use area and monitors the use situation and the infringement situation using the image inputted from the TV camera. The person information as detection result of the situation detec-

FIG. 15 is a schematic diagram of detection of visual lines of the non-user in the image according to the ninth embodiment of the present invention.

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In this way, in case the user permitted the service is specified in the service use area, the supply of the service is begun. During the supply of the service, if the user is not using the service or if the security is breached, the supply of the service finishes or interrupts. Accordingly, the security is maintained during all periods of beginning/supplying/end of the service. For example, in case the registered user is confirmed and supplied money through an Automatic Teller Machine, or the user operates a handy terminal by watching secret information on a display, the security of the user is effectively protected according to the present invention.

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As mentioned above, in the second embodiment, the supply of the service for each user is reserved until the work of each user is completed. In short, a right service-use

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The interactive control section 4 receives an indication of the user for the warning of the infringement and controls the supply of the service according to the indication. The kind of the indication is continuation/interruption/end of the service. The user selects the kind of the indication by, for example, using a keyboard. In FIG. 8, during the supply of the service, if the situation detection section 1 detects infringement by a non-user ("Yes" at step S11), the service supply permission section 2 sends the warning to the user (step S20). After sending the warning, the interactive control section 4 receives an indication of the user (step S21), the service supply permission section 2 controls the supply of the service according to the indication.

25 If the user indicates interruption of the service ("INTERRUPTION" at step S21), the interactive control section 4 outputs the indication of interruption to the service supply permission section 2. The service supply section 3
30 interrupts the supply of the service according to the indication of the interruption.

If the user indicates end of the service ("END" at step S21), the interactive control section 4 outputs the indication of end to the service supply permission section 2. The service supply section 3 finishes the supply of the service.

In this way, when the user receives the warning of infringement, the user can select continuation/interruption/end of service by using interactive function. As a result, if the user works through equipment in an office, whenever an office colleague (person not necessary for security) stands behind the user, interruption of the work is excluded. In short, a change for the worse of use-feeling of the equipment is avoided. Otherwise, when using the equipment in a public place, interruption of the service is indicated by the user for the warning of a non-user standing behind the user.

In the fifth embodiment, the user can select the indication to keep security in case of infringement of the security. After selecting the indication, the apparatus (equipment) can automatically keep the security of the user. In this case, if the warning of the infringement is outputted as an image, the user understands circumstances around the user by watching the image (the user and non-user are included). The user can select the indication (continuation/interruption/end of the service) according to the circumstances.

55 (e) Default action of neglecting the warning (sixth embodiment)

FIG. 9 is a flow chart of processing of the service supply permission section 2. In FIG. 9, steps S20, S21, S22, S23, S24 are added steps in comparison with FIG. 3. The construction of the security apparatus of the fifth embodiment is the same as in FIG. 7. In FIG. 9, during the supply of the service, if

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the situation detection section 1 detects an infringement situation ("Yes" at step S11), the service supply permission section 2 sends the warning to the user (step S20). After the warning, the interactive control section 4 receives indication of the user. In this case, if no indication of the user is received above predetermined time (step S22, S23), the interactive control section 4 outputs the purport of no indication to the service supply permission section 2. The service supply permission section 2 controls the supply of the service according to a predetermined control (step S24). For example, if continuation of the service is set as the predetermined control ("CONTINUATION" at step S24), the service supply section 3 continues to supply the service. If interruption of the service is set as the predetermined control ("INTERRUPTION" at step S24), the service supply section 3 interrupts the supply of the service. If end of the service is set as the predetermined controlling ("END" at step S24), the service supply section 3 finishes the supply of the service. On the other hand, if the indication of the user is received within the predetermined time ("Yes" at step S22), the interactive control section 4 receives the indication (step S21) and the service supply permission section 2 controls the supply of the service according to the indication. In this case, if the user indicates continuation of the service ("CONTINUATION" at step S21), the interactive control section 4 outputs the continuation indication to the service supply permission section 2. The service supply section 3 continues to supply the service. If the user indicates interruption of the service ("INTERRUPTION" at step S21), the interactive control section 4 outputs the interruption indication to the service supply permission section 2. The service supply section 3 interrupts the supply of the service. If the user indicates end of the service ("END" at step S21), the interactive control section 4 outputs the end indication to the service supply permission section 2. The service supply section 3 finishes the supply of the service.

In this way, if the user neglects a warning of infringement, the security of the user is kept according to a predetermined control (action of default). Otherwise, it is possible to control the supply of the service different from the predetermined control for some reasons by a user's indication in case of the warning. For example, in an office, as for the warning generated whenever a colleague stands behind the user operating the equipment, the user does not have to indicate continuation of the service. The predetermined control is already set as continuation of the service. In this case, the user can continue the operation while neglecting the warning. In case the user operates the equipment in a public place, the predetermined control is set as interruption of the service. In this case, security of the user for the equipment is protected while he neglects the warning.

(f) Security degree by unit of service/information (seventh embodiment)

In the above embodiments, predetermined security is activated for service or information. However, security degree is actually different by unit of service/information. If a fixed security degree is activated, useless interruption of the service is often executed. This happens in case of plural workers using information equipment. Accordingly, it is desired that the security is activated according to the kind of the service/information. For example, assume that electric mail is transmitted using a PC (personal computer) or a document is created using WP (word processor). Plural services are then supplied on the display of the equipment. The electric mail represents a private letter and its security degree is high. On the other hand, the security degree of the document by WP differs according to the kind of the

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document. While the user creates the document whose security degree is low, the security degree of the document grows by adding another important document. In this way, the security degree is dynamically changed according to the kind of the service/information.

In the seventh embodiment, the security degree is changed by unit of the service/information. FIG. 10 is a flow chart of processing of the service supply permission section 2 according to the seventh embodiment. In FIG. 10, step S25 added between S11 and S12 is a different step in comparison with FIG. 3. During the supply of the service, if the situation detection section 2 detects infringement of the security ("Yes" at step S11), the service supply permission section 2 controls the supply of the service according to the security degree set by the kind of service/information (step S25). In this case, it may be possible that the security degree is set to a mail tool to display the mail but not set to a WP tool. For example, when another person watches the display behind the user, the mail tool is only interrupted (the mail window is closed) and the WP window is continuously opened.

As for setting the security degree, for example, the user sets disclosure-possible at the head portion of mail to be sent. A window showing the mail tool does not react to the infringement of the security. As for both sending side or receiving side, the mail is able to remain disclosing.

If the user indicates a strict secret at the header of a document, the WP window to display the document reacts to the infringement of security. For example, the security degree for creating the document is dynamically changed by adding other important document. In this way, even if the service is supplied to the same object, the supply of the service is interrupted or continued according to the content (for example, regular document or strict secret document).

(g) detection of visual line 1 (eighth embodiment)

In the above embodiments, when another person watches the display behind the user creating a document, the infringement of security of the user is detected. However, it is not necessary to pay attention to the other person, but to pay attention to the visual line (or line of sight) of the user. For example, when the visual line of the user leaves the screen of the display, the window may be closed. In the eighth embodiment, by detecting a visual line of the user as use situation, the supply of the service is interrupted when the visual line leaves the screen.

FIG. 11 is a block diagram of the situation detection section 1 according to the eighth embodiment. A visual line detection section 16 is an added section in comparison with FIG. 2. The visual line detection section 16 detects movement of the visual line of the user in case the user (registered) is included in the person discrimination information D2. For example, the face area of the user is extracted from the image and the eye area is extracted from the face area. The visual line is pursued according to the eye area. In this case, if a direction of the visual line is toward a predetermined area (visual area of the screen), an indication is outputted. If the direction of the visual line is not toward the predetermined area, another indication is outputted. These indications represent visual line information D5.

In this way, in the eighth embodiment, the visual line information D5 is outputted to the service supply permission section 2 as one of the person information. FIG. 12 is a flow chart of processing of the service supply permission section 2 according to the eighth embodiment. In FIG. 12, step S26 is added instead of step S11 in comparison with FIG. 3. During the supply of the service, assume that the situation detection section 1 detects that the user is under a situation

FIG. 10 is a flow chart of processing of the service supply permission section 2 according to the seventh embodiment.

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to be supplied the service ("Yes" at step S8). In this case, the visual line detection section 16 keeps watch for the movement of the visual line of the user. If the direction of the visual line departs from the predetermined area of the display ("Yes" at step S26), the situation detection section 1 outputs the visual line information D5 to the service supply permission section 2. The service supply permission section 2 controls the service supply section 3 to interrupt the supply of the service (step S12). FIG. 13 is a schematic diagram of detection of the visual lines of the user in the image according to the eighth embodiment. As shown in FIG. 13, the visual lines of the user are detected from position of black eyes of the user's face in the image.

In this way, in the eighth embodiment, detection of the visual line of the user controls the supply of the service. Therefore, when another person walks behind the user, security of the service is kept only if the visual line of the user departs from the display.

(h) Detection of visual line 2 (ninth embodiment)

In the eighth embodiment, a direction of the visual line of the user controls the supply of the service. However, if another person looks furtively at the display behind the user, the supply of the service can not be controlled. If the user turns his eyes away from the display whenever the other person walks behind the user, the supply of the service is interrupted to every time. Therefore, in the ninth embodiment, detection of the visual line of the non-user controls the supply of the service.

FIG. 14 is a flow chart of processing of the service supply permission section 2 according to the ninth embodiment. In FIG. 14, step S27 is added step between step S11 and step S12 in comparison with FIG. 3. In this case, the visual line detection section 16 detects the visual line of the non-user. In case the person is not discriminated by referring to the person discrimination information D2 (the person is decided to be a non-user), the movement of the visual line of the non-user is detected. In the same way as in the eighth embodiment, the face area is extracted from the image including the non-user and the eye area is extracted from the face area. The visual line of the eye area is pursued. If a direction of the visual line of the non-user points to a predetermined area (visible area of the display), an indication is outputted. If the direction of the visual line of the non-user does not point to the predetermined area, another indication is outputted. This purport is represented as the visual line information D5. During the supply of the service, assume that the situation detection section 1 detects that the non-user infringes the security of the non-user ("Yes" at step S11). In this case, the visual line detection section 16 keeps watch for the move of the visual line of the user. If the direction of the visual line of the non-user points to the predetermined area, for example, the non-user watches the display behind the user ("No" at step S27), the situation detection section 1 outputs the visual line information to the service supply permission section 2. The service supply permission section 2 controls the service supply section 3 to interrupt the supply of the service. FIG. 15 is a schematic diagram of detection of the visual lines of the non-user in the image according to the ninth embodiment. As shown in FIG. 15, the visual lines of the non-user are detected from position of black eyes of the non-user's face in the image.

In this way, in the ninth embodiment, the detection of the visual line of the non-user controls the supply of the service. Therefore, in case the non-user looks furtively at the display behind the user, the security of the service for the user is kept.

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(i) Detection of visual line 3 (tenth embodiment)

In the tenth embodiment, detection of the visual line of the user and the non-user controls the supply of the service. FIG. 16 is a flow chart of processing of the service supply permission section 2 according to the tenth embodiment. In FIG. 16, step S26 and step S27 are added steps in comparison with FIG. 3. During the supply of the service, assume that the situation detection section 1 detects that the user is under a situation to be supplied the service ("Yes" at step S8). In this case, the visual line detection section 16 detects movement of the visual line of the user. If the visual line of the user departs from the predetermined area, for example, the user turns his eyes away from the display ("Yes" at step S26), the situation detection section 1 outputs the visual line information D5 to the service supply permission section 2. Then, the service supply permission section 2 controls the service supply section 3 to interrupt the supply of the service (step S12).

On the other hand, assume that the direction of the user points to the predetermined area of the display (the user does not turn his eyes away from the display) ("No" at step S26) and the situation detection section 1 detects that the non-user infringes the service of the user ("Yes" at step S11). In this case, the visual line detection section 16 keeps watch for movement of the visual line of the non-user. If the direction of the visual line of the non-user points to the predetermined area of the display (the non-user watches the display behind the user) ("No" at step S27), the situation detection section 1 outputs the visual line information to the service supply permission section 2. The service supply permission section 2 controls the service supply section 3 to interrupt the supply of the service (step S12).

In this way, in the tenth embodiment, detection of the visual line of the user and the non-user controls the supply of the service. Therefore, the security of the service for the user is strengthened.

In the eighth, ninth, tenth embodiments, the visual line of the user or the non-user is detected. However, by detecting a direction of a face of the user or non-user, the supply of the service may be controlled. In this case, as for the user, if the direction of the user's face does not point to the display, the supply of the service is interrupted. As for the non-user, if the direction of the non-user's face points to the display, the supply of the service is interrupted. As for the method for detecting the direction of the face, the face area is extracted from the image including the user or the non-user. The direction of the face is pursued according to the face area.

In the above embodiments, the image is used for detecting the person information. However, sound or wireless may be used for detecting the person information. In case of the sound, the user is specified by the user's voice existing in the service-use area. If the user's voice is continuously detected, it is decided that the user is under a situation to be supplied the service. If a voice other than the user's is detected, it is decided that the security of the service of the user is infringed. In case of the wireless, the user is specified by detecting ID information of a wireless card. The user previously brings the wireless card with him. If the ID information of the user's wireless card is continuously detected, it is decided that the user is under a situation to be supplied the service. If ID information other than the user's wireless card is detected, it is decided that the security of the service of the user is infringed.

FIG. 17 is a schematic diagram showing a method of supplying a software for the present invention. A series of processings of the service supply permission section 2

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